THE OCCURRENCE OF GROUND WATER IN THE TIJERAS SOIL CONSERVATION DISTRICT

BERNALILLO COUNTY, NEW MEXICO

By
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ABSTRACT

This report shows location of wells for which data was obtained, and depth to the water table, in a portion of the Tijeras Soil Conservation District. Lack of municipal water supply over much of the area necessitates the use of wells for domestic and stock use and for irrigation of lands located above the irrigation canals.

The important geological formations within the area which affect ground water occurrence are Quaternary and Tertiary sedimentary deposits with interbedded volcanics. Both the Quaternary and the Tertiary beds are sources of ground water within the area.

The slope of the water table in the valley area is about five feet to the mile down the valley, which closely approximates the gradient of the river. Slope of the water table beneath the mesas is generally toward the river and to the south, although local variations occur.

The quality of water obtained within the area is, in most places, satisfactory, although no water analyses have been made in connection with this study. In general, the deeper wells obtain softer water than the shallow wells, and the water from wells over 80 feet deep in the valley may be expected to be of good quality.

INTRODUCTION

Purpose and Scope of the Investigation

This report is intended as a guide in the development of water wells for irrigation, stock and domestic use within the Tijeras Soil Conservation District. The district includes a large portion of the area in the vicinity of Albuquerque. Actual boundaries of the district are somewhat vague and, as the extreme western portion of the potential district contains very few cooperators at present, this portion of the district has not been included herein.

The investigation was made to determine the approximate depth to the water table within the area and to ascertain possible yields to be expected from wells therein. The investigation was in the nature of a reconnaissance and, of necessity, must leave unanswered many questions regarding ground water within the area. No attempt has been made to measure water levels or to compute the amount of ground water recharge. Adjusted aneroid elevations checked against U. S. Geological Survey Topographic maps were used for the most part in determining elevations at well sites. Elevations for some of the wells of the City of Albuquerque were furnished by the City.

The depth to water as shown on the map is based on reported water levels and is thus subject to some inaccuracies. A few depths measured by the U. S. Geological Survey in 1941 do not vary appreciably from the reported levels in the same wells. Used with an understanding of its limitations, the map should serve as a guide for drilling for water in the area.

Location and Extent of the Area

The boundaries of the Tijeras district are not clearly defined but they roughly comprise the area bounded on the north by Sandoval county, on the south by the south boundary of the Isleta Indian Reservation, on the east by the Sandia and Manzano Mountains, and on the west by the Rio Puerco.

Actually only a small part of this area is within the district although the size of the district is growing steadily by petition of individuals. This growth by petition necessarily makes the district an assemblage of individual farms and blocks of farms and ranches scattered throughout the area but confined for the most part to the Rio Grande Valley.

Previous Investigations

The first published information concerning ground water in the Middle Rio Grande Valley is contained in U. S. Geological Survey Water Supply Paper 188 by W. T. Lee, published in 1907. This report deals briefly with ground water conditions near Albuquerque.

The only detailed analysis of ground water resources of this area is contained in a report by C. V. Theis, published in 1938. This study included an intensive survey of the depth to water in the Middle Rio Grande Valley and was made under the auspices of the National Resources Committee Rio Grande Joint Investigation in 1936. The study was continued in 1937 in cooperation with the State Engineer of New Mexico and in 1938 in cooperation with the Middle Rio Grande Conservancy District.

An investigation pertaining to City of Albuquerque wells and a plan for future development of the municipal supply is contained in a report by Hasie and Green, Consulting Engineers of Lubbock, Texas, dated August, 1948.

Acknowledgments

C. V. Theis and Clyde S. Conover of the U. S. Geological Survey reviewed the preliminary draft of the report and suggested revisions. They also made available the logs and other information on wells contained in their files. Harold B. Elmendorf, Dan H. Griswold, and E. M. Thorp also read the report and offered many suggestions. Many residents of the area supplied information about their wells. Mr. Charles E. Wells, City Manager of Albuquerque, and Mr. Phillip Lynedecker of the City Water Department furnished logs of wells and other information regarding city-owned wells. Sherman A. Wengerd, Howard Sheets, and Van and A. D. Turner, furnished numerous well logs and other information on wells. Sol Taylor furnished information on yields, drawdowns and depth to water for several wells. E. T. Heard, Jack Riner, Fred Hunnicut, Joe Turner and Erby White, well drillers of Albuquerque, also furnished information on wells within the area.

GEOLOGY

The Tijeras Soil Conservation District includes the northern portion of the Albuquerque - Belen Basin, a subdivision of the Rio Grande depression which, in turn, lies within the Basin and Range Physiographic province.

The Albuquerque valley which is nearly coincident with the Tijeras Soil Conservation District is separated from the Belen valley by a partial constriction at Isleta. This constriction is not a canyon but only a narrow place in the flood plain, formed by the outcrop of a layer of basalt.

The area lies in a structural depression formed in late Tertiary time, principally by downfaulting. It is bounded on the east by the uplifted block of the Sandia and Manzano mountains and on the west by a complex fault zone which was established as a zone of weakness during the early Tertiary warping of the Colorado Plateaus.

Following the crustal disturbances, streams eroded the Carboniferous and the Mesozoic sedimentary rocks, and the early and middle Tertiary volcanic rocks and deposited sediment in the depression. Contemporary volcanism produced local basaltic lava flows. The resulting basin deposits and the interbedded basalt constitute the Santa Fe formation of Miocene-Pliocene age.

Following the post-Santa Fe deformation, an extensive erosion surface was graded to the ancestral Rio Grande which nearly followed its present course but was then 400 to 500 feet above the present channel.

The formations outcropping in the Tijeras Soil Conservation District consist almost entirely of Tertiary and Recent sediments and interbedded volcanic rocks. Upper Cretaceous sediments outcrop in the extreme western portion of the area, and uplifted granite capped by Magdalena limestone in the Sandia and Manzano mountains occurs on the eastern border of the district. As the formations older than the Santa Fe have little bearing upon ground water in the area, they will not be further discussed.

The Santa Fe formation was deposited in a subsiding structural depression. Its character reflects the materials comprising the higher land masses to the east, west and north. The Santa Fe formation consists of sand, gravel, silt, and clay, laid down in a heterogeneous mixture of axial river gravels, alluvial fan deposits, and playa beds. It outcrops in a narrow belt along the eastern edge of the Rio Grande flood plain and in a similar narrow belt near the Rio Puerco. It underlies almost the entire district but for the most

part, is overlain by Recent alluvium and blow sand. The thickness of the Santa Fe is considered to be in excess of 2,000 feet. Mr. Leslie Love 1/ reports a well drilled by the Middle Rio Grande Conservancy District near the present Municipal Beach reached a depth of 2,600 feet without encountering bed rock.

On the west mesa, the Recent materials consist of a thin deposit of alluvium and blow sand overlying the Santa Fe. The east mesa consists of a low terrace surmounted by coalescing alluvial fans.

The Rio Grande flood plain deposits are the most important of the recent sediments as sources of water. In addition to the flood plain deposits, two types of terraces have been developed. They are: those resulting from deposition of fans by tributaries, with subsequent lateral planation by the river, and those built by the main stream. The Rio Grande by lateral planation has largely removed the deposits that it had laid down at higher grades.

The broad flood plain of the river is a conspicuous feature. The deposits underlying the flood plain consist of unconsolidated sand, gravel, silt and clay. The depth of the flood plain deposits is unknown but logs of some wells in the valley indicate a thickness of between 70 and 150 feet overlying the Santa Fe formation.

There is no sharp dividing line between the Recent alluvium and the Santa Fe formation, and it may be assumed, for hydrological purposes, that the Quaternary material although not so well consolidated is a continuation of Santa Fe deposition.

GROUND WATER

Ground water is the water in the zone of saturation beneath the land surface of the earth. It exists in numerous voids, or interstices, in the materials it occupies, and is the source of supply for wells and springs. If the water is confined by an overlying impervious stratum and is under pressure it is said to be confined water or artesian water. Unconfined ground water is said to be under water table conditions. The water table may be defined as the upper surface of the zone of saturation. The surface of the water in a well generally stands at the water table.

1/ Love, Leslie, Oral communication

The water table is not a level surface but an irregularly sloping surface. Irregularities may be caused by differences in thickness, differences in permeability of water-bearing formations or by unequal additions or withdrawals of ground water. The movement of water is in general in the direction of the greatest slope of the water table. The rate of movement, assuming a uniform cross sectional area and uniform permeability of the aquifer, is proportional to the hydraulic gradient and the permeability of the water-bearing material. In the Tijeras Soil Conservation District, the water table slopes in the general direction of the surface drainage.

The slope of the water table in the valley portion of the area is about five feet to the mile down the valley, which is practically the same as the gradient of the river. The water table beneath the east mesa varies in the rate of fall, but in direction the fall is toward the west and south.

Development of Ground-Water Supplies

Ground water is obtained from wells in the Tijeras Soil Conservation District for public supply, irrigation, industrial, domestic and livestock use. When water is pumped from a well, the water level is depressed in the well and in the formation surrounding the well. The amount of lowering in feet is called the drawdown. The drawdown is roughly proportional to the quantity of water pumped and inversely proportional to the permeability of the aquifer; hence the drawdown generally is small in wells that obtain water from well sorted gravel and coarse sand but may be excessive in wells in less permeable materials that contain fine sand, silt or clay. The rate of pumping in gallons per minute per foot of drawdown is called the specific capacity of the well. In this area reported specific capacities vary from 7 to 395 in wells for which pumping tests and drawdown measurements are available. The specific capacity of 395 for well number 60 appears high, and may be due to inaccurate reporting.

When a well is pumped, the water table in the vicinity of the well declines and takes a form similar to that of an inverted cone, called the cone of depression. The well is at the apex and the slope of the cone is greatest nearer the well and becomes less at increased distances from the well, until a point is reached where the drawdown is imperceptible. The distance to this point is

called the radius of influence and the circular area described by this radius is called the area of influence of the well. The radius and area of influence are not constant but continue to increase at a diminishing rate with increased length of pumping of the well. Only until the radius of influence reaches an area of rejected ground water recharge or ground water discharge, such that an amount of water equal to that discharged by the well can be added to the aquifer or prevented from leaving the aquifer, does the area of influence reach equilibrium. If the discharge of the well is increased, the drawdown at any particular distance is increased, but the radius of influence is not immediately affected.

Due to the lenticular character of the Tertiary and Quaternary deposits, both in plan and section, no accurate predictions can be made as to the occurrence of any one aquifer at a specific location or depth. Good water-producing gravels in one well may be entirely absent in a nearby well. It seems logical to assume that the lenticular beds are elongated in the axial direction of the valley and a comparison of strata in wells is likely to show more uniformity in this direction than transverse to the river valley. Whether this condition may extend beneath the mesa areas cannot be determined, due to wider spacing of the wells.

GROUND WATER OCCURRENCE BY AREAS

Valley Area

The valley area of the Tijeras Soil Conservation District extends along the river for a distance of from 20 to 25 miles, from Sandoval County on the north to Valencia County on the south. In width, the area varies from about two miles to three and-a-half miles. The depth to the water table within the valley varies from a few feet to 75 feet. In general, the water table is within 8 feet of the surface throughout the flood plain area although along the margins of the valley, greater depths to water occur.

In the valley, ground water is depended upon to supply countless homes, as a supply of irrigation water on a few farms, for considerable industrial use, and as the only source of supply for the city of Albuquerque. Depths of wells for domestic use range from 10 to 15 feet in some dug wells to more than 100 feet in some drilled wells. Irrigation wells are generally less than

a hundred feet in depth and some industrial wells, where quality is of little importance, are less than 100 feet deep. Wells used for Public supply generally exceed 100 feet in depth. The Public Service Company well No. 3 was drilled to a depth of 723 feet.

The City of Albuquerque has drilled approximately 25 wells to supply the city water system and two additional wells are being drilled at the present time. These wells range in depth from 65 feet to 716 feet. In addition, the city has drilled three wells to supply the municipal bathing beach. The city wells are located generally along a north-south line in close proximity to north Broadway. Although the depth of the wells varies considerably, their s ecific capacity is fairly uniform.

Most of the irrigation wells in the valley are located south of Albuquerque and on both sides of the river. Many of these wells are for the irrigation of land located above the irrigation canals although, in recent years, a shortage of surface water for irrigation, especially in the lower reaches of the area, has caused several individuals to drill wells for supplemental supply during periods of water shortage in the canals.

Almost all of the irrigation wells in the valley are less than 100 feet deep and range in diameter from 8 inches to 16 inches, and in output from about 450 to 1200 gallons per minute. The deepest irrigation well on record is at the mouth of Tijeras Canyon and has a depth of 315 feet. This well is reported to yield 750 gallons per minute, with a specific capacity of 19.7

It is doubtful whether any extensive development of ground water for irrigation will be undertaken in the valley area served by the irrigation canals although a considerable number of irrigation wells may be drilled for use as a supplemental supply during periods of shortage of surface water. The necessity of paying the Conservancy tax of approximately $6.00 per acre per year will prohibit many persons from installing wells as a source of irrigation water.

Many of the larger industrial users maintain their own wells as a source of supply. The yield of many of these wells is unknown. The greatest yield reported is for the well of the Sandia Sand and Gravel Company on North Highland Road, which produces 1100 gallons per minute.

Source of Ground Water for the Valley Area

The sources of ground water in the valley area are: underflow from the mesas on both sides of valley, seepage from the river, seepage from canals and irrigated lands, and local rainfall. Underflow from the mesas, seepage from the river, and seepage from irrigated lands and canals are all important in ground water recharge but their relative importance could not be determined within the scope of this investigation.

In the aggregate, a considerable amount of ground water must come from the higher lands bordering the valley, especially from the east mesa. The general slope of the water table under this area is toward the east margin of the valley and supports this theory. Any other disposal of the ground water under the mesas is almost certainly blocked. The relatively impervious mass of the Sandia and Manzano mountains prevents ground water movement to the east. Movement to the west is cut off by relatively impervious beds of Cretaceous rocks and by the fault zone, previously mentioned. An increase in the amount of ground water supplied by the mesas may have occurred since drainage systems have been installed. The increase in well development in the valley during the past few years may also have caused an increase in the inflow to this area.

The lowering of the water table at any point begins a lowering of hydrostatic pressure that gradually extends farther and farther from the initial point and causes inflow from increasingly more remote localities. As the water coming into the drained areas moves from more distant areas, the gradient under which it moves decreases. Hence, with the lowering of the water table in the valley by drainage, the quantity of ground water inflow from the mesas must have been increased by withdrawal from storage. This inflow will gradually decrease until a new equilibrium is established.

In the Barr district, Theis[2/] found that considerable water moved into the valley area from the direction of the mesa. The close proximity to the mouth of Tijeras arroyo and the fanning out of flood waters east of the railroad may have some effect on the ground-water contribution in this area.

2/ Theis, C.V. Ground water in the Middle Rio Grande Valley, New Mexico; Regional Planning, Part VI, The Rio Grande Joint Investigation in the Upper Rio Grande Basin; Vol. 1, pp.291, National Resources Committee, 1938.

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Theis 3/ estimated that an average of 0.5 cubic feet per second per lineal mile of valley border was contributed to the ground water supply of the valley from the mesa areas, or a total of one cubic foot per second per lineal mile of valley. There is undoubtedly general percolation toward the valley throughout its length but the largest contributions come from the vicinity of the arroyos which intermittently carry large quantities of water.

An inspection of accompanying cross sections of the water table reveals several local variations in the water table beneath the mesa areas. Low water table areas back from the river indicate a partial southerly movement of ground water under both mesas, and indicate that a portion of the ground-water supply beneath the mesa west of Albuquerque may be contributed to the valley further downstream. A low water table area near the east edge of the valley would receive recharge from the east mesa and from the river. Almost all of the city wells are located in or near this trough and pumping from these wells is probably responsible, at least in part, for this lowering.

In the vicinity of Albuquerque and especially to the south, seepage from irrigated lands is doubtless an important source of supply of ground water. This is indicated by a sharp drop in ground-water levels after the irrigation season. Although no estimate can be made of the amount of recharge from this source, it probably equals that from any other source and may exceed the contribution from the mesas.

Theis 4/ states that, during the period from 1918 to 1922, there was very little movement of ground water, either into or out of the Rio Grande Valley, in the area above Albuquerque. This may indicate that ground water seepage from the river during this period was small.

The ground water trough near the east edge of the irrigated district indicates a movement of water to this trough from the river. Comparison of original reported water levels for 1932 in city wells with levels in 1948 reported on a few wells by Hasie and Green 5/ show drops of

3/ Theis, C. V. Idem. pp. 283

4/ Theis, C. V. Op. Cit. pp. 289

5/ Hasie and Green, Master plan report, Water Works Facilities, City of Albuquerque, New Mexico. Vol. I. Aug.1948.

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from five to fifteen feet. This trough, near the east edge of the irrigated valley may be attributed to the existence of an ancient river channel or to pumping from wells, or to a combination of both. The pumping has probably contributed to the lowering of the water table in this area and may have a more pronounced effect in the future, causing a greater movement of ground water into the area. Hasie and Green 6/ have computed a possible water table lowering of 40 feet in 20 years for the middle of the city well field, and a maximum lowering of 50 feet over a period of 50 years.

A report by the U. S. Corps of Engineers 7/ covering a period of 20 months' record shows losses in the river ranging from 4 to 15 cubic feet per second per mile for the reach from San Felipe to Isleta. The average loss per mile was 7.07 cubic feet per second for the period. The loss is proportional to the flow of the river, with the greater loss occurring during period of high flow. The percent loss varies inversely with the amount of flow. The loss approaches 100 percent for low flows and decreases to about 8 percent for the largest flows. These losses are in addition to the water intercepted and returned to the river by the riverside drains. The loss of surface water by transpiration by plants within the channel bottom is considered small. Evaporation from a free water surface at Albuquerque is about 5 feet per year. Assuming a river channel 1,000 feet wide, which is on the conservative side, and a length of 44 river miles for the reach, the estimated loss due to evaporation is 26,620 acre feet per year. Total loss for the year, as given by the U. S. Corps of Engineers 8/, is 246,594 acre feet, indicating a loss due to seepage and transpiration by plants of 219,974 acre feet annually, or an annual loss of 4,999 acre feet per mile.

The contribution to ground water through seepage losses in the reach between San Felipe and Isleta is thus shown to be of considerable magnitude. It is probable that much of this water returns to the channel as surface flow above Elephant Butte reservoir.

6/ Hasie and Green, Op. Cit. pp.34

7/ U. S. Corps of Engineers, Albuquerque Dist., Rio Grande and Tributaries, New Mexico, Survey for Flood Control, Sept. 1, 1947 Vol. 7, Appendix F. Sedimentations Table 14 pp. 341

8/ U. S. Corps of Engineers, Idem pp.341

Although ground water may be a new source of supply within the confines of the district, for the valley as a whole, it cannot be considered as an additional supply. Ground water in the valley is closely related to the surface supply and in general water pumped from wells must be subtracted from the water supply available in the Rio Grande. Water which is ground water within the limits of the Tijeras Soil Conservation District is tributary to the flow of the Rio Grande.

Yield of Wells

Yields and drawdown were obtained for only 17 wells in the valley area. specific capacity varies from 7.8 to 395. No correlation of aquifers between wells may be made, either as to depth or lateral distribution. In general, the shallower wells drawing from the hard water zone show the highest specific capacity.

Studies by Hasie and Green 9/ show the radius of influence of the city wells to be approximately 700 feet. Based on this information, they recommend a spacing of about 1500 feet for all future city wells, and a spacing of 2,000 feet for wells pumping 1,000 gallons per minute. Although measurements were made on only two wells, the information should serve as a guide in future well development.

9/ Hasie and Green, Op. Cit. pp. 32, Vol. I

TABLE I. YIELD OF WELLS IN VALLEY AREA

	Map No.	Owner	DEPTH (Feet)	YIELD (G.P.M.)	DRAW-DOWN (Feet)	SPECIFIC CAPACITY (Yield in Gal. per Min. per foot of Drawdown)
	3	City Well #2	446	1,016	66	15.4
*	5	3	551	1,060	62	17
*	7	4	715	800	50	16.2
	8	6	185	867	45	19.3
*	9	7	300	640	93	6.9
*	10	8	277	560	72	7.8
*	13	11	375	720	77	9.4
*	14	12	356	1,140	56	19.8
*	17	15	180	1,260	118	10.7
	28	Tartar	315	750	38	19.7
	33	Sandia Sand & Gravel	212	1,100	40 (?)	27.6(?)
	45	Creamland Dairy	170	425	47	9.
	47	Freeman	52	1,000	9	111.
	60	Eddy	100	1,185	3	395.
*	96	A.T.& S.F. Tie Plant	65	1,000	9	111.
	132	Menaul School	152	700	22	31.8
*		City Well #3H	65	440	22	20.

* Hasie and Green, City of Albuquerque, New Mexico Master Plan Report, Water Works Facilities August, 1948. Vols. I and II.

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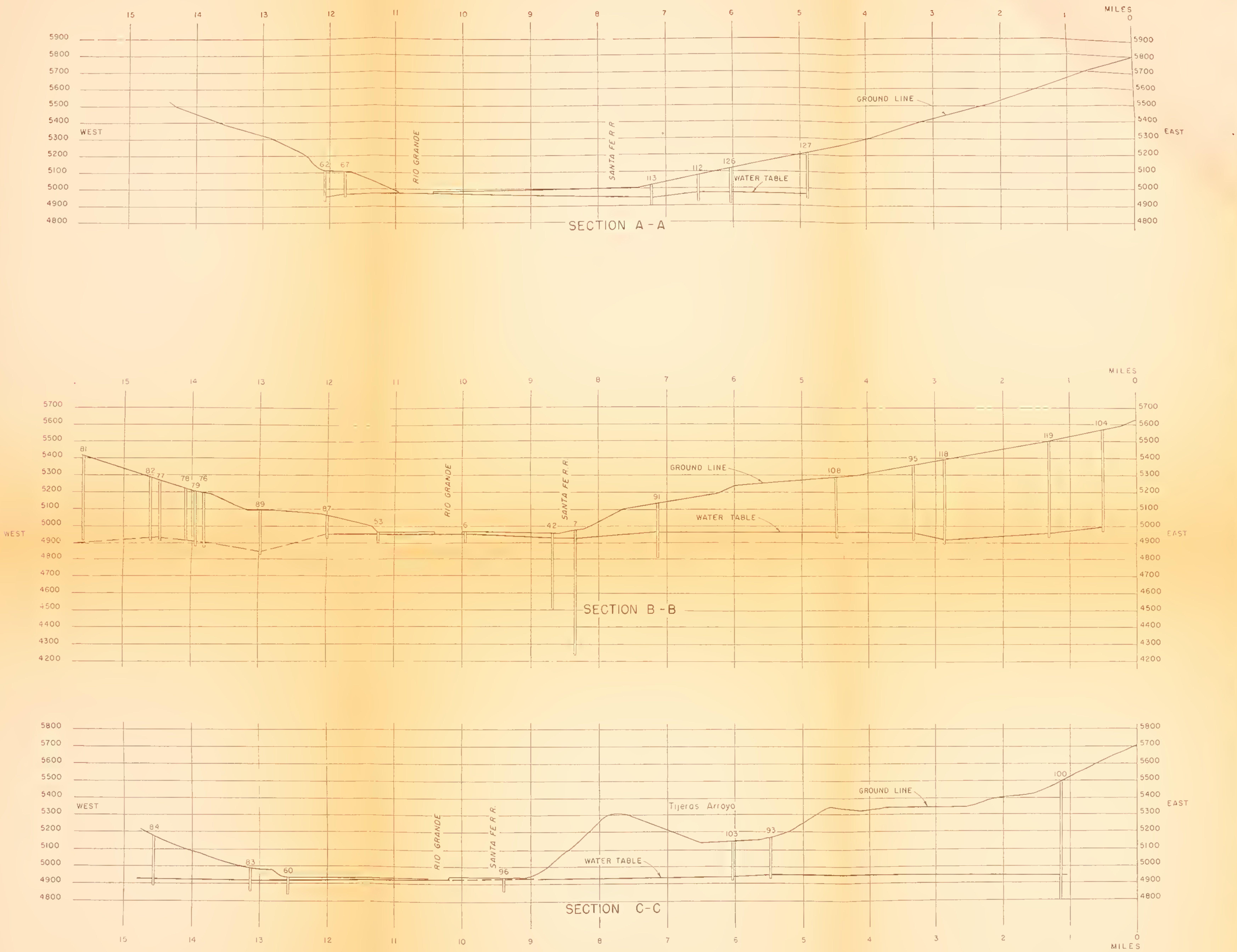

TIJERAS SOIL CONSERVATION DISTRICT
DIAGRAMMATIC SECTIONS SHOWING DEPTH
OF WELLS AND WATER TABLE

MARCH 1949
TOM O. MEEKS

West Mesa

A considerable number of wells have been drilled on the west mesa. The greatest concentration of wells is along Highway 66 and in the area slightly north of the highway. Information on many of these wells is not available and such information as is available is subject to inaccuracies. An attempt has been made to use only that information which seemed most reliable.

Practically all of the wells in this area are used for domestic and stock water and at least three wells are used as public supply. Two irrigation wells have been drilled to date and indications are that several more may be drilled within the next few years.

In the vicinity of Highway 66, ground water is generally obtained at approximately river level for a distance of about two miles west of the river. Wells farther west must go below river level to obtain water. A water table area lower than the river level apparently exists about two-and-a-half miles west of the river. Westward from this area, a slight rise is noted but a depth of approximately 25 feet below river level is needed to reach the water table about four miles west of the river. A dry hole 500 feet deep was drilled about five-and-a-half miles west of the river. The bottom of this hole, at approximately elevation 4917, is about 35 feet below river level but the water table was not reached.

Although the conclusion is admittedly based on information which is subject to some inaccuracies, it appears that very little ground water is contributed to the valley from the mesa area just west of Albuquerque. A north-south movement in part of the area is indicated, which suggests that ground water beneath the mesa may be contributed to the river valley farther downstream.

Favorable Areas

Well No. 62, near the natural gas pipe line, has a reported yield of 500 gallons per minute and shows a specific capacity of 71, which is considerably greater than most of the valley wells. The well is reportedly bottomed in 33 feet of well sorted, clean gravel.

The most likely location for future irrigation wells appears to be in line from well number 62 to well number 89. The lifts would be somewhat greater than for wells farther to the east but yields should also be greater.

East Mesa

Wells on the east mesa have been developed primarily for domestic and stock use. Two wells at the Bel Air addition furnish water for public supply. The University of New Mexico obtains its water supply from three wells. Several test wells are now being drilled at the Sandia Base in an attempt to develop sufficient water to supply the needs of the project.

The water table beneath the University is approximately 15 feet higher than river level. From the University westward, it slopes to a depth approximately 15 feet below river level near the railroad. Eastward from the University, the water table is essentially level until, in the vicinity of the fairgrounds, according to available reported data, it begins to slope downward toward the east. Near the mountains, the water table rises again to an elevation of approximately 40 feet above river level.

Elevations of the water table indicate a general movement to the west and to the south. Steeper slopes of the water table occur from the University of New Mexico to the valley area, and from the vicinity of Highway 66 to Tijeras arroyo.

A variation in depth of wells occurs near the base of the mountains and in the drainage ways issuing from the mountains. Near the drainages, water has been obtained at depths of approximately 50 feet. At least two wells have been drilled on granite ridges and apparently obtained water from the weathered zone of the granite. Yields of these wells are small.

Yield of Wells

Information on yields of wells and drawdown was obtained for 6 wells on the east mesa. The specific capacity ranges from 14 in the Nazareth Sanatorium wells to 120 in the Albuquerque Sand and Gravel well. Although a wide variation is shown in specific capacities, a notable feature is the higher average rate than is shown in the valley wells.

TABLE 2. YIELD OF WELLS ON THE EAST MESA

MAP No.		DEPTH (Feet)	YIELD (G.P.M.)	DRAW-DOWN (Feet)	SPECIFIC CAPACITY (Yield in Gal. per Minute per foot of Drawdown)
31	Albuq. Sand & Gravel	154	1,200	10	120
92	Univ. N.M. No. 3	305	750	16	47
94	Old Oxnard Field	486	60	0	60
133	Nazareth Sanatorium	264	350	25	14
134	Nazareth Sanatorium	290	350	25	14
135	Turner's Ranch		500	10	50

QUALITY OF WATER

No water analyses were made for this report although information on the quality of ground water was obtained from other sources. The quality of water is highly important for several reasons. The practical use of water for various industrial plants is largely controlled by the various elements contained in the water. The use of irrigation waters containing a high percentage of sodium tends to impair the physical condition of the soil, while the use of waters with a low percentage of sodium tends to maintain a good soil structure.

From the data obtained, it is evident that, in general, the deeper waters are somewhat less saline than the shallow waters. The percentages of sodium and of chloride in deeper wells, while only slightly different from those for shallow wells, are appreciably higher than those reported for surface water.

Total salts and total hardness, in parts per million, of water from wells shown in Table 3 are from the report by Hasie and Green . 10/ Large yields of hard water are usually obtained in the city wells at about 60 feet. Soft water is usually obtained at a depth of about 110 feet.

10/ Hasie and Green, op. cit. Fig. 5, pp. 1, Vol. II.

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For other wells in the valley for which soap hardness tests have been made, soft water is usually obtained at depths of about 80 feet, although some soft water is obtained in shallower wells.

TABLE 3. DISSOLVED SOLIDS AND HARDNESS OF WATER IN WELLS IN PARTS PER MILLION.

MAP No.	OWNER			DEPTH (Feet)	Dissolved Solids	Total Hardness
13	City	Well	#11	375	279	127
14	"	"	#12	356	322	163
16	"	"	#14	168	998	568
17	"	"	#15	180	896	484
19	"	"	#17	276	264	130
	"	"	#3 H	65	962	576
7	"	"	# 4	715	329	115
3	"	"	# 2	446	309	112
5	"	"	# 3	551	338	106
8	"	"	# 6	185	256	131
9	"	"	# 7	300	273	124
10	"	"	# 8	277	473	248
12	"	"	#10	405	281	134
	Sec. 32, T.10N., R. 3E				639	343

Note: Water of good chemical quality should not contain over 500 P.P.M. Dissolved Solids, but 1,000 P.P.M. is permissible. Total hardness is reported in terms of Calcium Carbonate ($CaCO_3$).

SUMMARY AND CONCLUSIONS

Ground water is available in sufficient quantity for most uses throughout the area covered by this investigation. It is recovered from the recent alluvium in the valley and along the drainages near the mountains. The Santa Fe formation is the source of water beneath most of the mesa area and for the better quality water in the valley.

Large quantities of water are available in the alluvium of the valley at depths of approximately 60 feet but this water is apt to be hard. Wells on the mesas usually encounter more permeable aquifers and water is of satisfactory quality but the depth, for most irrigation purposes, may be excessive.

Sufficient water may be obtained in the alluvium of drainageways at the base of the mountains for limited domestic and stock use. This water should be of good quality.

There is some evidence of a lowering of the water table in the city field since pumping began, but few original water levels in wells could be obtained for comparison with present levels.

TABLE 4. RECORD OF WELLS

MAP No. of WELL	OWNER	LOCATION	DEPTH (Feet)	DEPTH TO WATER (feet)	YIELD Gals. per min.	DRAWDOWN (feet)	DIAMETER (inches)	USE *
1	City of Albuquerque		422	18	600		12-1/2	M
2	" " "		102	33	1,030			M
3	" " "		446	18	1,016	66	12-1/2	M
4	" " "		80	5			14	R
5	" " "		551'9"	19	1,060	62	12-1/2	M
6	" " "		60				14	R
7	" " "		716	21	1.030	77.7	13	M
8	" " "		185	20	867	45	13	M
9	" " "		300		640	93	13	M
10	" " "		277	34	560	72	13	M
11	" " "		293	33	380			M
12	" " "		405	47	710		13	M
13	" " "		375	33	720	77	13	M
14	" " "		356	28	1,140	56	13	M
15	" " "		365		880		13	M
16			168	28	500 +			M
17			180	29	1,260	118		M
18			356	33(1948)	1,210			M
19			276	46(1948)	970		12	M
20	" " "		453				13-1/8	M
21	" " "		598	21			14	M
22			142				14	M
23			578				14	M
24			288				13-3/8	M
25			310				14	M
26	" " "	Candelaria Road & R.R.	Being Drilled					M
27	" " "	South Broadway	Being Drilled					M
28	Tartar No. 1	Mouth of Tijeras Canyon $NW\frac{1}{4}$ $SE\frac{1}{4}$, S.17, T.9 N., R.3 E.	315	76	750	38	10	I
29	Shirk		Abandoned					I
30	Phillips	$N\frac{1}{2}$, S.18, T.9 N., R.3 E.	85	33	420		8	I
31	Albuq.Sand & Grav.	Plant South of Town $NE\frac{1}{4}NE\frac{1}{4}$, S.32, T.10 N., R3 E.	154	70	1,200	10	16	C
32	F. Davis	Near Kinney Brick Plant South Second Street	77	35	500		12	I

*M - Municipal; D - Domestic; S - Stock; I - Irrigation; C - Industrial; R - Recreation.

TABLE 4. RECORD OF WELLS (Continued)

MAP No. of WELL	OWNER	LOCATION	DEPTH (Feet)	DEPTH TO WATER (feet)	YIELD Gals. per min.	DRAWDOWN (feet)	DIAMETER (Inches)	USE*
33	Sandia Sand & Gravel	1/2 Miles No. Menual School	212	38	1,100	40?	12-1/2	
34	Dr. John Myers	Sandia Sanatorium, Highland Road		10 ?	260			I
35	" " "							
36	Corley	$SW\frac{1}{4}NE\frac{1}{4}$, S.27, T.11 N., R. 3 E	120	79'6"	200?		8	I
37	McDougal	$NW\frac{1}{4}SW\frac{1}{4}$, S.27, T.11 N., R. 3 E.	100	58	450		10	I
38	S. Sanchez	Highland Road	80					D
39	Stronghurst School	Menaul Road & N. Second Street	84					D
40	Coca Cola Plant		481				8	C
41	Zeitman Produce	North Second Street	106				6	C
42	Imperial Laundry		449	15				C
43	Public Service Company	At Plant	723	14				C
44	R. L. Harrison	Fourth Street and R.R.	44	22				C
45	Creamland Dairy	Plant on North Second Street	170	29'5"	425	47	10	C
46	Ike Talley, Casa Grande	West Central at Bridge	320				8	D
47	Jack Freeman	Pajarito Area	52	8	1,000	9	16	I
48	Atrisco School		535	(Abandoned)			6	D
49	Love		71				5	D
50	Fagan		53					D
51	Hadley		92	6				D
52	Carpenter		92	6				D
53	P. Larkin	West Central, 66 Court	40					D
54	Cason		82					D
55	K. C. Balcomb	Rio Grande Boulevard	95		35			D
56	Sam Farone	Pueblo Solano Addition	75	7	25			D
57	Brock	West End Alameda Bridge	60		60			D
58	Cohenour, Dr. L. B. #1		55	10	1,000		10	I
59	" " " " #2		65		1,000		10	I
60	Eddy		100	16	1,185	3(?)		I
61	Spanish Amer. Seminary	Sandoval	101	12 ?	150		10	
62	C. C. Duerkson	$NW\frac{1}{4}SW\frac{1}{4}$, S.35, T.11 N., R.2 E.	185	152	500		12	I
63	Bond		983	873			5	S
67	West Mesa Brick Plant	$NE\frac{1}{4}SW\frac{1}{4}$, S.35. T.11 N., R.2 E.	138	123	7		5	C
68	Campbell	$SE\frac{1}{4}NE\frac{1}{4}$, S.34, T.11. No. R.2.E	250		225		8	ABAND.

TABLE 4. RECORD OF WELLS (Continued)

MAP No. of WELL	OWNER	LOCATION	Depth (feet)	DEPTH TO WATER (feet)	YIELD Gals. per min.	DRAWDOWN (Feet)	DIAMETER (Inches)	USE*
69	Lavaland Water Company	Burquist Avenue	155	135	400			D
70	" " "	" "	100 to 112	70				D
71	Danks, West Mesa Water Company		240	140				D
72	Hall		150					D
73	Bridges		168	142				D
74	Griego		180					D&S
75	West Mesa Sawmill		445	300?				D&C
76	Williams	West Central	317				4	D
77	West Mesa Trailer Court		356	344	6		6	D
78	Bailey		304	296				D
79	Vic Barrett			291				D
80	Navajo Lodge			148				D
81			500	Dry				Aband.
82			379					D
83			142	80				D
84	Barboa		318	280				
85	Saavadra		100	75				D
86	Rockwell		103	80				D
87	El Campo Court	West Central	136	112				D
88	Sawmill	North of Cutter-Carr	170					D
89	I. White	West Central	165	150				D
90	U. N. M. #1		240	200	500			D&I
91	U. N. M. #2		350	190	500		12	D&I
92	U.N. M. #3		305	150	750	16	16	D&I
93	Gentry	SE¼NE¼, S.11, T.9 N., R.3 E.	239	210			12	Not in Use
94	Oxnard Field	NE¼SE¼, S. 31, T.10 N., R.4E	486	469	60	None		
95	El Jardin Court	SE¼, S.19, T.10 N., R. 4 E.	450	410				D
96	AT&SF Tie Plant	South Second Street	65	4	1,000	9		C
97	Valley Gold	North Fourth Street		11				C
98	Public Service Co. #1			20				C
99	" " " #2			20				C
100	Sandia Base #2	S.15, T.9 N., R. 4. E.	684	537			8	Test
101	" "	NW¼SE¼, S. 31, T.10., R.4 E.	1,204	470			8	Test

TABLE 4. RECORD OF WELLS (Continued)

MAP No. of WELL	OWNER	LOCATION	DEPTH (Feet)	DEPTH TO WATER (Feet)	YIELD Gals. per Min.	DRAWDOWN (Feet)	DIAMETER (Inches)	USE
102	Wyset		200					D&S
103	Gentry	SW$\frac{1}{4}$,S.11, T.9 N., R.3E	215	195				D&S
104	Slack, W. E.	NE$\frac{1}{4}$NW$\frac{1}{4}$, S.27, T.10 N., R.4E.	591	565				D
105	Audriola, J.	S. 26, T.10 N., R. 4 E.	678	658				D
106	Westerner Inn	S. 26, T.10 N., R. 4 E.	676					Aband.
107	Slack, W. E.	SW$\frac{1}{4}$SE$\frac{1}{4}$, S.16, T.10 N., R.3E	200	164				D
108	Dyer	NW$\frac{1}{4}$SE$\frac{1}{4}$, S.24, T.10., R.3 E.	362	327				S
109		NW$\frac{1}{4}$SW$\frac{1}{4}$, S.11, T.10., R.3 E.		172			6	Aband.
110	Baker, E. H.	NE$\frac{1}{4}$SE$\frac{1}{4}$, S.3, T.10 N., R.3 E	175	160?				D
111	Strayer	NE$\frac{1}{4}$SW$\frac{1}{4}$, 3.T.,10., R.3 E.	187	130			6	D
112	Shakay	NE$\frac{1}{4}$NW$\frac{1}{4}$, S.3, T.10 N., R. 3 E.	145	90			6	D&I
113	Miller, J. L.	SE$\frac{1}{4}$SE$\frac{1}{4}$.,S.33, T.11 N., R.3E	135	91				D&S
114	Richardson	SW$\frac{1}{4}$SW$\frac{1}{4}$, S.13, T.10 N., R.3E	315	290				D
115	Simms #2	NE$\frac{1}{4}$SW$\frac{1}{4}$, S.30, T.11 N., R.4E					8	D&S
116	Simms #1	NE$\frac{1}{4}$SW$\frac{1}{4}$, S.27, T.11 N., R.3E					8	S
117	Yearout	SE$\frac{1}{4}$SE$\frac{1}{4}$, S.14, T.10 N., R.3E					6	D
118	Hill, E.	NW$\frac{1}{4}$NW$\frac{1}{4}$, S.29, T.10 N., R.4E.	512	482				D
119	Jarborg. A.	SW$\frac{1}{4}$SE$\frac{1}{4}$, S.21, T.10 N., R.4E	565	540				D
120		SE$\frac{1}{4}$SE$\frac{1}{4}$, S.18, T.10 N., R.4E		387			8	D&S
121	Smith	SE$\frac{1}{4}$NE$\frac{1}{4}$, S.14, T.10 N., R.3E	295	265			8	D
122	Mac Pherson, H.R.	NW$\frac{1}{4}$SE$\frac{1}{4}$, S. 3, T.10 N., R.3E		137				D
123	Finley, C.V., Est.	SE$\frac{1}{4}$NW$\frac{1}{4}$, S.11, T.10 N., R.3E		210				Aband.
124	Montgomery)	NE$\frac{1}{4}$NE$\frac{1}{4}$, S. 3, T.10 N., R.3E	219	137				D.S& I
125	")							
126	Montgomery, E.	NE$\frac{1}{4}$NE$\frac{1}{4}$, S. 3,T.10 N., R.3E	200	137				D.S & I.
127	Montgomery, E.E.	NW$\frac{1}{4}$NW$\frac{1}{4}$, S. 1,T.10 N., R.3E	283	242				D&S
128	Canyon Lodge	East Central Avenue	660	648				D
129	Graham Bell	SW$\frac{1}{4}$SW$\frac{1}{4}$, S. 1, T.10 N.,R.3E	280	265				
130	Bel Air	SW$\frac{1}{4}$NE$\frac{1}{4}$, S.11,T. 10 N.,R.3E	235	210				D
131	Bel Air	SE$\frac{1}{4}$NE$\frac{1}{4}$, S.11,T.10 N., R.3E	291	245 - Abandoned due to bad hole. New well is being drilled.				

TABLE 4. RECORD OF WELLS (Continued)

MAP No. of WELL	OWNER	LOCATION	DEPTH OF WELL (Feet)	DEPTH TO WATER (Feet)	YIELD Gals. per min.	DRAWDOWN (Feet)	DIAMETER (Inches)	USE
132	Menaul School		152	48	700	22	18	I
133	Nazareth San.		264	80	350	25		D
134	" "		290	80	350	25		D
135	Turner				500	10		
136	Casa Grande Lodge	West Central	320					D
137	Black, Wm.	West Mesa	183	152	950	18		I
138	Norins Realty Co.	(Wildcat #2)	5,024	350				Aband.
139	" " "	(Wildcat #1)	573	300				"
140	Hix		565	525				
141	Isleta #1		123	104				S
142	Isleta #3		312	280				S
143	Isleta #8		612	566				S
144	B. W. Hughes		50	40				D
145	Sharp		160	148				D
146	Sloan		170	148				D
147	Hughes		285					D
148	W. D. Turner		170	156				D
149	Cutter-Carr		210?	180?				D
150	J. Riner		174	152				D

REFERENCES

1. Hasie and Green - City of Albuquerque, New Mexico. Master Plan Report. Water Works Facilities. August 1948. Volumes I and II.

2. Lee, W. T. - Water Resources of the Rio Grande Valley, N.M. U. S. G. S. Water Supply Paper 188. 1907.

3. Theis, C. V. - Ground Water in the Middle Rio Grande Valley, New Mexico; Regional Planning, Part VI. The Rio Grande Joint Investigation in the Upper Rio Grande basin, Vol. I, pp. 268 - 291, National Resources Committee, 1938.

4. Theis, C. V. and Taylor, George C., Jr. - Ground-water Conditions in the Middle Rio Grande Valley, New Mexico. Twelfth and Thirteenth Biennial Reports. State Engineer of New Mexico, pp. 263 - 272, 1934 - 1938.

5. Wright, Herbert E., Jr. - Tertiary and Quaternary Geology of the Lower Rio Puerco Area, New Mexico. Bulletin of the Geological Society of America. Volume 57, pp. 383 - 456, 1946.

LOG OF WELLS

MAP No. 7 - CITY WELL No.4, BROADWAY AND TIJERAS

	DEPTH (Feet)	THICKNESS (Feet)
Adobe	12	12
Sand	18	6
Clay	20	2
Sand and Gravel	26	6
Sandy Clay	28	2
Sand Rock	32	4
Clay	34	2
Sand and Gravel	62	28
Coarse Sand	66	4
Packed Sand	86	20
Sandy Clay	91	5
Sand and Gravel	93	2
Sandy Clay	98	5
Fine Sand and Streaks of Clay	113	15
Red clay	116	3
Fine Sand	126	10
Yellow Clay	128	2
Fine Sand and Streaks of Clay	177	49
Sand and Gravel	187	10
Water Sand	192	5
Red Clay	195	3
White Clay and Rock	206	11
Quick Sand	216	10
Packed Sand	222	6
Red Clay	223½	1½
Packed Sand	228½	4½
White Clay	230½	2
Packed Sand	238	8
Sand Rock	246	8
Clay	251	5
Sand Rock	254	3
Sandy Clay	263	9
Sand Rock	271	8
White Sandy Clay	283	12
Red Clay	298	15
Sandy Clay	303	5
Yellow Clay	323	20
Sand	333	10
Yellow Clay and Sand	363	30
Water Sand	418	55

MAP No. 7, CITY WELL No. 4, BROADWAY AND TIJERAS (Continued)

	DEPTH (Feet)	THICKNESS (Feet)
Yellow Clay	438	20
Water Sand	473	35
Yellow Clay	475	2
Water Sand	498	23
Coarse Water Sand	528	30
Red Clay	530	2
Coarse Water Sand	538	8
Yellow Clay	540	2
Coarse Water Sand	564	24
Fine Sand	580	16
Yellow Clay	585	5
Fine Brown Sand	590	5
Coarse Water Sand	650	60
Red Sandy Shale	652	2
Fine Brown Sand	672	23
Red Clay	682	7
Sandy Clay	685	3
Red Clay	687	2
Red Clay and Sand	694	7
White Sand	716	22

MAP No. 10 - CITY WELL No. 8, NORTH BROADWAY

	DEPTH (Feet)	THICKNESS (Feet)
Brown Sand	5	5
Heavy Gravel	15	10
Brown Sand and Pea Gravel	24	9
Heavy Gravel and Brown Sand - Water . . .	43	19
Dry Black Gumbo	51	8
Heavy Gravel - Water	70	19
Pea Gravel, Coarse Sand - Water	81	11
Very Coarse Sand - Water	89	8
Soft Brown Sand	93	4
Gray Sand and Gravel - Water	102	9
Hard Packed Sand, dry	106	4
Loose Gray Sand - Water	135	29
Loose Gray Sand and Pea Gravel - Water . .	145	10
Loose Gravel - Water	151	6
Coarse Gray Sand, some Gravel - Water . .	169	18
Fine Gray Sand	178	9
Gray Sandy Shale	179	1
Fine Gray Sand	200	21
Coarse Gray Sand, Loose Sandstone or very thin Streaks of Sandstone	212	12
Coarse Gray Sand - Water	222	10
Packed Brown Sand	225	3
Coarse Gray Sand - Water	237	12
Fine Gray Sand - Water	246	9
Hard Gray Sandstone	249	3
Brown Sand - Water	277	28

MAP No. 20 - CITY WELL No. 18, CORONADO PARK

	DEPTH (Feet)	THICKNESS (Feet)
Stiff Adobe	4	4
Fine Gray Sand	17	13
Fine Gray Water Sand	28	11
Coarse Gray Water Sand	43	15
Coarse Gray Water Sand and Heavy Gravel	58	15
Brown Clay, Sand and Conglomerate	64	6
Coarse Gray Water Sand	87	23
Brown Clay	96	9
Coarse Gray Water Sand	105	9
Coarse Gray Water Sand and Gravel	123	18
Coarse Gray Water Sand, Streaks of Cemented Sand and Gravel	191	68
Gray Water Sand - less Coarse Sand	230	39
Fine Gray Water Sand	248	18
Gray Sandstone	253	5
Fine Gray Water Sand	261	8
Sticky Dense Brown Clay	270	9
Coarse Gray Water Sand	281	11
Sticky Dense Brown Clay	307	26
Coarse Gray Water Sand	314	7
Dense Brown Clay	326	12
Fine Brown Sand	331	5
Red Clay and Sand	349	18
Fine Gray Water Sand	368	19
Dense Red Clay	372	4
Fine Sand	378	6
Red Clay	379	1
Fine Sand	386	7
Red Clay	390	4
Fine Sand	395	5
Red Clay	398	3
Gray Water Sand, Medium	416	18
Red Clay	423	7
Coarse Gray Water Sand	438	15
Gray Sand, Fine	444	6
Coarse Gray Water Sand	453	9

MAP No. 23 - CITY WELL No. 21, GRACELAND ACRES

	DEPTH (Feet)	THICKNESS (Feet)
Adobe, sandy clay, brown clay	38	38
Coarse sand, gravel, boulders, water	70	32
Coarse gray water sand, pea gravel, some coarse gravel	88	18
Brownish red clay	93	5
Clay conglomerate, streaks cemented sand	98	5
Fine gray water sand	105	7
Coarse gray water sand and gravel	132	27
Dense red clay	137	5
Coarse gray water sand and pea gravel	161	24
Hard gray cemented sand and gravel	163	2
Coarse gray water sand and gravel.	176	13
Brown clay	179	3
Gray water sand	183	4
Red clay	187	4
Coarse gray water sand, some pea gravel, streaks cemented sand	212	25
Coarse gray water sand and gravel	230	18
Coarse gray water sand, some pea gravel	237	7
Coarse gray water sand	283	46
White clay	287	4
Tight brown sand	288	1
Dense brown clay, sticky	297	9
Gray water sand	314	7
Brown sandstone, soft	315	1
Brown clay - siltstone	319	4
Gray water sand, streaks red brown clay	331	2
Hard cemented sand	337	6
Coarse gray water sand	364	27
Dense brown clay	374	10
Gray water sand	378	4
Dense brown clay	382	4
Coarse gray water sand	391	9
Hard gray cemented sand	398	7
Coarse gray water sand, some pea gravel	407	9
Dense brown clay	413	6
Tight gray sand	418	5
Coarse gray water sand, some pea gravel . . .	423	5

MAP No. 23 - CITY WELL No. 21, GRACELAND ACRES (CONTINUED)

	DEPTH (Feet)	THICKNESS (Feet)
Light brown clay, very dense and sticky	434	11
Light brown clay and gravel conglomerate . . .	445	11
Fine gray water sand	457	12
Light brown clay, dense and sticky	464	7
Fine brown silty sand	470	6
Gray water sand	484	14
Brown clay conglomerate	497	13
Gray water sand, coarse toward bottom	528	31
Brown clay conglomerate	543	15
Tight gray water sand	548	5
Brown sandy clay conglomerate	553	5
Coarse gray water sand, hard streaks cemented sand	578	25

MAP No. 28 - TARTAR - AT MOUTH OF TIJERAS ARROYO

	DEPTH (Feet)	THICKNESS (Feet)
Top soil	8	8
Sand and gravel	20	12
Gravel	41	21
Adobe	46	5
Sand and gravel	54	8
Clay and gravel conglomerate	65	11
Sand and gravel - water	92	27
Blue sandy clay	96	4
Sand and gravel - water	110	14
Brown sand, some pea gravel	116	6
Gray water sand, streaks red clay and silt	125	9
Pink clay and rock conglomerate	128	3
Coarse gray water sand	174	46
Hard brown packed sand and soft sandstone	177	3
Gray water sand, streaks brown sandstone .	183	6
Coarse gray water sand	191	8
Sticky pink clay	192	1

NOTE: This well was later deepened to 315 feet, but no log is available for that portion.

MAP No. 46 - CASA GRANDE LODGE, WEST CENTRAL NEAR RIVER

	DEPTH (Feet)	THICKNESS (Feet)
Sand	45	45
Sand and gravel	50	5
Sand	100	50
Sandy clay	105	5
Sand	155	50
Red clay	165	10
Sand	175	10
Sandy clay	185	10
Sand	210	25
Red clay	220	10
Sand	250	30
Red Clay	255	5
Sand	280	25
Red Clay	285	5
Sand	310	25
Sand and Gravel	320	10

MAP No. 90 - COCA COLA PLANT - 205 EAST MARQUETTE

	DEPTH (Feet)	THICKNESS (Feet)
Sand	55	55
Gravel	60	5
Sand	218	158
Red clay	224	6
Sand	254	30
Red clay	260	6
Sand	270	10
Red clay	275	5
Sand	295	20
Red clay	305	10
Sand	325	20
Sandy clay	335	10
Sand	355	20
Sand, coarse	375	20
Sand, lime	470	95
Gravel, coarse	481	11

MAP No. 63 - 3 MILES WEST OF THE VOLCANOES, BOMBING RANGE No.1

	DEPTH (Feet)	THICKNESS (Feet)
Sand - streaks of sand bearing small gravel	218	218
Soft sandstone and sandy conglomerate	231	13
Sand, heavy, bearing coarse sand and pea gravel	510	279
Sandy clay and clay of reddish tint	756	246
Cream colored or yellow clay, sticky	790	34
Sandy yellow clay	835	45
Sandy yellow clay, more clay	862	27
Soft sandy clay - water at 875	902	40
Coarse water sand, some pea gravel	923	21
Hard gray sandstone	929	6
Coarse gray water sand, good	933	4
Pink clay	960	8
Brown sandy clay	979	19
Sticky dense brown clay	983	4

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MAP No. 91 - UNIVERSITY OF NEW MEXICO NO. 2

	DEPTH (Feet)	THICKNESS (Feet)
No record	156	156
Coarse to medium sand	174	18
Light gray, silty marl	189	15
Light brown, somewhat limy, fine sandstone	200	11
Medium to coarse, clean pebbly sand, water stood at 204	244	44
Fine to medium sand, limy and clayey . . .	250	6
Clean medium sand	260	10
Sandy gravel	265	5
Medium sand	275	10
Coarse sand	280	5
Fine and medium sand	291	11
Medium to coarse sand	300	9
Medium grained sand	305	5
Very fine gravel	307	2
Medium grained sand	310	3
Very fine gravel	315	5
Mostly clay, some medium sand	330	15
Same as above	350	20

MAP No. 95 - EL JARDIN COURT, EAST CENTRAL AVENUE, SE$\frac{1}{4}$ SEC.18, T.10N. R.4E

	DEPTH (Feet)	THICKNESS (Feet)
Clay	5	5
Sandy clay	140	135
Sand and gravel	150	10
Sand	200	50
Clay	210	10
Gravel and shale	300	90
Sand	350	50
Coarse sand and some water	400	50
Sand and small gravel	435	35
Heavy gravel - water	450	15

MAP No. 100 - SANDIA BASE No. 2 - Sec. 15, T.9S., R.4E

	DEPTH (Feet)	THICKNESS (Feet)
Clay and decomposed granite	70	70
Clay and decomposed granite	210	140
Reddish clay and decomposed granite	235	25
Coarse broken gravel	240	5
Clay and decomposed granite	260	20
Clay and decomposed granite, light brown .	543	283
Very soft clay with fine sand and water . .	550	7
Streaks of hard clay with thin layers of sand, water 635 to 670	670	120
Clay and sand, very soft	676	6
Formation very much harder, apparently rock	682	6
Rock, bottom of hole	684	2

MAP No. 101, SANDIA BASE TEST WELL No. 1, NW$\frac{1}{4}$SE$\frac{1}{4}$, SEC. 31T, 10 N.R.4E

	DEPTH (Feet)	THICKNESS (Feet)
Sand, clay and fine gravel	50	50
Sand, clay and fine gravel	74	24
Sand, clay and fine gravel	105	31
Disintegrated granite	260	155
Clay and fine sand	287	27
Disintegrated granite	300	13
Fine to coarse sand	518	218
Red clay	550	32
Clay and sand	573	23
Sand and red clay	607	34
Sand and gravel	618	11
Sand	655	37
Coarse sand	690	35
Clay	705	15
Fine gravel	715	10
Sand	730	15
Clay	735	5
Sand	758	23
Hard rock	767	9
Disintegrated granite	773	6
Coarse, hard, sharp sand	805	32
Packed sand - shell indications	940	135
Fine gravel	952	12
Hard rock	983	31
Fine gray sand	1,022	39
Medium hard sandstone.	1,050	28
Coarse sand	1,085	35
Fine gravel	1,115	30
Coarse sand	1,128	13
Medium fine, hard, sharp sand	1,204	76

MAP No. 131 - BEL AIR COMPANY - SEC. 11, T. 10 N., R. 3 E.

	DEPTH (Feet)	THICKNESS (Feet)
Top Soil	2	2
Caliche	8	6
Sand and adobe	15	4
Sand and adobe	28	13
Sand	30	2
Gravel	41	11
Sand and gravel	49	8
Gravel	54	5
Sandy adobe	67	13
Sand	75	8
Sand and gravel	80	5
Sand	95	15
Sandy adobe	105	10
Sand	110	5
Gravel	117	7
Clay	121	4
Gravel and sand	134	13
Sand	140	6
Clay	145	5
Sand	155	10
Sand and gravel	182	27
Clay	194	12
Sand	200	6
Clay	222	22
Gravel	234	12
Sand	239	5
Sand and gravel	250	11
Clay	254	4
Gravel - water at 254 feet	264	10
Quick sand	268	4
Sand and gravel	291	23
Sand rock	291	

MAP No. 137 - BILL BLACK - WEST MESA, NEAR NATURAL GAS PIPE LINE AT NORTH EDGE OF ATRISCO GRANT

	DEPTH (Feet)	THICKNESS (Feet)
Sand	4	4
Sandy adobe	9	5
Sand and gravel	22	13
Sand, trace of adobe	40	18
Adobe	110	70
Sand	151	41
Gravel - water at 152 feet	181	30
Clay	183	

MAP No. 139 - NORINS REALTY COMPANY, INC., WELL No. 1 - NW$\frac{1}{4}$ S. 19, T. 11 N., R. 4E.

	DEPTH (Feet)	THICKNESS (Feet)
Clay	4	4
Gravel	20	16
Clay	40	20
Clay	50	10
Sand and gravel	110	60
Clay	138	28
Coarse gravel	186	48
Sand and gravel	255	69
Granite wash	292	37
Clay	300	8
Water sand and gravel	368	68
Granite wash	387	19
Clay	417	40
Water gravel	461	44
Granite wash	573	112

MAP No. 138 - NORINS REALTY COMPANY, WELL No. 2 - S. 19, T.11 N., R. 4 E.

	DEPTH (Feet)	THICKNESS (Feet)
Surface soil	6	6
Gravel	14	8
Sand	26	12
Boulders	78	52
Coarse Sand	100	22
Boulders	138	38
Fine sand	150	12
Cemented gravel, hard	160	10
Sand and gravel, softer	205	45
Cemented gravel, arkose	210	5
Soft sand	220	10
Arkose	225	5
Soft sand	230	5
Arkose	250	20
Arkose, very hard	350	100
Soft sand, water stands at 350	360	10
Granite wash, hard	415	55
Soft sand	442	27
Granite wash, hard	450	8
Coarse gravel	460	10
Arkose	500	
Arkose, very hard	550	50
Arkose, very hard, with thin strata of red shale	600	50
Gray and red shale	620	20
Hard, coarse, cemented gravel	650	30
Red, gray shale	700	50
Arkose, hard	750	50
Gray shale	760	10
White, hard sand	800	40
Arkose, very hard	820	20
Arkose, very hard, with red and gray shale breaks	850	30
Red and gray shale	950	100
Coarse sand and gravel carrying water	960	10
Brown shale	1,000	40
Quick sand	1,050	50
Sand and gravel	1,100	50
Brown shale	1,150	50
Soft sand	1,175	25
Coarse gravel	1,200	25
White lime	1,210	10
Brown shale	1,250	40

(Continued)

MAP No. 138, NORINS REALTY COMPANY, WELL No. 2, S. 19, T.11 N., R 4.E.

	DEPTH (Feet)	THICKNESS (Feet)
Sand and gravel	1,300	50
Brown shale	1,310	10
Coarse gravel	1,325	15
Sand	1,375	50
Coarse gravel	1,425	50
Brown shale	1,460	35
Gray lime	1,473	13
Fine sand	1,550	77
Gray and red shale	1,600	50
Sand	1,625	25
Coarse gravel	1,675	50
Granite boulders	1,690	15
Hard, coarse granite wash	1,700	10
Hard granite wash	1,750	50
Soft sand	1,775	25
Boulders	1,800	25
Granite wash	1,850	50
Red shale	1,875	25
Gray shale	1,925	50
Graphite wash	1,935	10
Granite boulders	1,950	15
Brown shale	1,960	10
Hard lime	1,975	15
Gray lime	2,000	25
Red shale	2,025	25
Hard granite boulders	2,050	25
Graniteboulders, hard	2,100	50
Granite wash	2,150	50
Gray shale	2,160	10
Hard gray sand	2,180	20
Gray shale	2,345	165
Gray sand, hard	2,400	55
Gray hard sand	2,410	10
Gray shale, soft	2,500	90
Soft gray shale	2,550	50
Hard gray shale	2,650	100
Hard gray sandstone	2,700	50
Hard gray sand	2,750	50
Gray sand, softer	2,800	50
Gray sand, hard	2,850	50
Gray shale	2,890	40
Gray, soft sand - water	3,002	112

(continued)

MAP No. 138, NORINS REALTY COMPANY, WELL No. 2, S. 19, T.11 N. R4.E.

	DEPTH (Feet)	THICKNESS (Feet)
Gray, soft sand	3,110	108
Soft sand	3,118	8
Gray shale	3,218	100
Very hard gray sand	3,300	82
Gray sand, softer	3,350	50
Soft sand	3,400	50
Very hard, gray, sandy lime	3,445	45
Hard, gray, sandy lime	3,480	35
Gray shale	3,600	120
Lime shell	3,610	10
Pink shale	3,640	30
Gray sand, hard	3,650	10
Gray sand	3,700	50
Gray sand, hard	3,780	80
Gray shale	3,810	30
Sand, gray, soft	3,820	10
Gray sand, harder	3,900	80
Gray sand, hard	3,960	60
Gray sand, softer	4,020	60
Brown shale	4,040	20
Gray sand, hard	4,100	60
Black sand, soft	4,300	200
Black and gray sand, harder	4,400	100
Gray sand, hard	4,460	60
Dark gray sand, hard	4,480	20
Gray sand, hard	4,560	80
Hard gray sand	4,600	40
Gray sticky shale	4,637	37
Gray sticky shale	4,710	73
Gray hard sand	4,776	66
Gray sticky shale	4,780	4
Gray hard sand	4,795	15
Gray shale	4,810	15
Gray hard sand	4,822	12
Gray hard sand with strata of sticky shale	4,870	48
Gray shale	4,930	60
Gray hard sand	4,950	20
Gray soft sand	4,970	20
Gray sticky shale	4,980	10
Gray sand, soft	5,024	44


N
VOLCANOES
LAVA FLOW
ELENA GALLEGOS GRANT
NAZARETH SANATORIUM
Alameda
Bear Canyon Arroyo
TOWN OF ALBUQUERQUE GRANT
Candelaria Road
RIO GRANDE
U.S. 85
ALBUQUERQUE
UNIVERSITY OF NEW MEXICO
STATE FAIR GROUNDS
Embudo Arroyo
U.S. 66
Five Points
TOWN OF ATRISCO GRANT
U.S. VETERANS HOSPITAL
AIRPORT
Arroyo Tijeras
AT&SF RR
COORS ROAD
Pajarito
PAJARITO GRANT
Bart
SECOND STANDARD PARALLEL
Los Padillas
ISLETA PUEBLO GRANT
R2E R3E
R3E R4E
T.11N. T.10N.
T.10N. T.9N.
BM EL 4993
BM EL 5062
BM EL 5309
BM EL 5746
BM EL 5101
BM EL 5268
BM EL 5373
BM EL 5487
BM EL 5134
A
B
C
LEGEND
• 100 WELL FOR DATA REFER TO MAP NUMBER IN TABLE 4 OF TEXT
—400— DEPTH TO WATER TABLE IN FEET
MAP OF TIJERAS SOIL CONSERVATION DISTRICT
SHOWING DEPTH TO WATER, IN FEET,
BELOW LAND SURFACE
SCALE 1"=1 MILE
MARCH 1949
TOM O. MEEKS
SOIL CONSERVATION SERVICE - REGION 6